Behavioral Changes Following Participation in a Home Health Promotional Program in King County, Washington

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This study examined behavioral changes in households after participation in a home environmental assessment. Home assessment visits by a trained coach, which involved a walk-through in the home with the home residents, were conducted in 36 homes. The walk-through included a list of recommended behavioral changes that the residents could make to reduce their exposures to home pollutants in areas such as dust control, moisture problems, indoor air, hazardous household products, and hobbies. Recruited households were surveyed 3 months after the home assessment to evaluate their implementation of the recommendations. Following the home visits, 31 of 36 households reported making at least one behavioral change, and 41% of the recommendations made by the volunteer coaches were implemented. In conclusion, this study found that the majority of the households who participated in the home assessment reported implementing at least one recommendation. This home health promotional method was effective in influencing behavioral changes. *Key words*: behavior change, dampness, dust, health, indoor air, vacuuming, ventilation.

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Indoor pollution has been ranked by both the EPA Science Advisory Board (*1*) and the Centers for Disease Control (*2*) as a high environmental risk. Evidence indicates that concentrations of many pollutants in air, dust, and soil are substantially higher indoors than outdoors (*3–5*). Exposure to pollutants arises from many sources in the home including heating (*6*) and cooking systems (*7*), dust (*8*), household hazards (*9*), chipping paint (*10*), and insecticides (*9*). Several reviews have summarized studies which report that many of these pollutants pose a significant risk to people (*11,12*). Home pollutant exposure may increase the risk of asthma and allergies, cancer, respiratory infections, symptoms of sick building syndrome, neurologic disorders, and other illnesses (*13*).

Individuals with allergic respiratory disease are especially at risk for aggravation or irritation by a variety of indoor air pollutants (*14*). It is known that indoor environmental tobacco smoke (*15*) and dust mites aggravate asthma, especially in infants and children (*16–19*). House dust mite avoidance is a recommended strategy for controlling asthma (*18,19*). Cat dander and cockroach feces also are known to provoke asthma attacks in some individuals (*19*). Dampness in the home is conducive to the growth of molds and subsequent respiratory symptoms in children (*20,21*).

Structural and behavioral modifications to reduce exposure to agents that can cause allergies and asthma have included encasement of mattresses and box springs, removal of carpeting, and frequent cleaning or removal of carpet and upholstered furniture (*22,23*). The Master Home Environmentalist (MHE) program in Seattle, Washington, was established to educate the public on environmental home pollutant issues with volunteer coaches who interact with home residents. The objective of this study was to evaluate behavioral changes of residents who participated in a home assessment visit using a survey tool from the MHE—the Home Environmental Assessment List (HEAL). This study is described in full by Leung (*24*).

Methods

The study was designed to evaluate behavioral changes 3 months following a HEAL home visit in 50 homes; data from 36 households were eventually collected. The study was approved by the University of Washington Human Subjects' Office, and informed consent was obtained from all subjects. Participating households received HEAL home visits during fall and winter. Three months later, a behavioral change questionnaire was administered over the telephone to those households to detect behavioral changes. We also conducted a health questionnaire centered on symptoms of allergy and asthma; however, this part of the study was not successful due to inconsistent answers by subjects.

Eligibility criteria for participating households were established to control for some potential confounders: 1) households with at least one allergy and/or asthma sufferer were eligible to target a sensitive population; 2) clerical and administrative employees in the Seattle area were targeted to reduce confounding factors from occupational pollutant exposures that could influence health symptoms (e.g., solvents, combustion fumes); 3) smoking households were excluded from this study because of the acute and long-term effect of smoking on health and the potential of interference with symptoms; and 4) households that were planning home construction or remodeling were also excluded from the study because of the potential of exposures to dust particles and paint and solvent fumes that could aggravate allergies and asthmatic symptoms.

Fourteen volunteers (coaches) trained during a 10-week educational program were available to perform HEALs from the MHE program. These volunteers were selected and assigned to homes by the MHE office. This method is representative of the normal HEAL assignment procedure. In order to expedite the HEAL home visits, volunteers were paid a fee of $15 per home. Ordinarily MHE volunteers are not paid, but this fee was used as an incentive to complete HEAL visits in a timely manner. Volunteers were instructed to perform the HEALs in the usual way. No other instructions were given to these volunteers. The number of completed HEAL documentations per coach returned to the office prior to this study was used as a surrogate for experience level.

Recruitment. Participants were recruited from various clerical and administrative departments of two public service agencies and a university. Recruitment was achieved through both business meetings and electronic mail messages. Fifty-two homes were originally recruited for this study. Due to lack of ability to contact some residents at follow-up, data from 36 homes were used giving a retention rate of 69%. Recruitment

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and HEAL visits began at the end of September 1995 and continued through the month of January 1996. Postintervention surveys by a study investigator were conducted during the months of February through June 1996, 3 months after the HEAL home visits.

HEALs. The volunteer coach and resident walked through the home using the HEAL to identify specific environmental and health risks and to set priorities for action. The 10-page HEAL contains questions divided into five categories: dust and lead control, moisture problems, hazardous products, indoor air pollution, and special risks. Answers to questions are categorized into multiple choices leading to low, medium, and high concern ratings. These ratings help to guide the coach and the resident in developing appropriate interventions.

Following the HEAL, coaches provided residents with recommendations for reducing exposure to indoor pollutants. Examples of these interventions include taking off shoes at the door when entering the house, efficient vacuuming and cleaning methods, switching to less toxic household products, using barrier cloths on pillows and mattresses, and increasing ventilation. Follow-up contacts with the households were normally made by phone 2 weeks and 3 months after a HEAL was conducted to verify that households have proper knowledge, resources, and skills. In our study, the investigator called participants 3 months after the HEAL to assess behavior changes using an evaluation survey based on the HEAL. We also selected four recommendations that seemed most important based on potential aggravation of allergic diseases and asked all participants about adoption of these to provide a standardized comparison among homes. The 3-month follow-up questionnaire determined that some homes had been practicing these behaviors prior to our study. The standardized list included use of a barrier cloth on mattresses and pillows, increased frequency of vacuuming, removal of shoes, and opening windows or using the fan in the bathroom.

Data on income were derived from the U.S. Census Bureau (U.S. Department of Commerce, 1990). The 1988 median household income data were categorized by zip codes of participating homes. Based on this estimate, the average household income for homes in the study was $36,505.

Statistical analysis. Descriptive statistics were used to determine if the households made any behavioral changes 3 months after their HEALs. Spearman correlation coefficients were used to estimate the association between household income and volunteer experience and number of behavioral changes. All analyses were performed using the SPSS statistical package (SPSS, Inc., Chicago, IL).

Results

Behavioral changes by the participating households maintained 3 months after the home visits were documented using an evaluation survey. After subtracting the number of actions that the families had been doing all along from the number of actions taken per family after the HEAL visit, 31 of 36 households made at least one change in categories listed in the HEAL while only 4 households did not make any changes. We also analyzed for adoption of the standardized actions even if they had not been recommended by the coaches. Nineteen of 36 (51%) households made such changes in the standardized actions. On average, a family made 3.1 (range = 0–8) changes after their HEAL home visit. Four homes made one change while 26 homes made more than one change.

Table 1 shows changes in behavior based on the number of homes that implemented recommendations. Two homes were not given a documented list of recommendations from the volunteer; thus, this number (n = 34) is different from the number of homes with a medium or high concern rating (n = 36). Table 1 provides a descriptive picture of the problems in the homes and the areas in which the homes eventually made changes.

Table 2 provides information similar to Table 1, but displays the data by HEAL items rather than by households. The percent of HEAL items with medium or high concern ratings are shown, with the average number of medium or high concern items per home rated by the coaches in each category/number of HEAL items in that category shown in parentheses. For example, in the category of dust control, the HEAL includes 41 items concerning control of dust. An average of 20 of 41 items were rated of high or medium concern (49%) by the coaches in this study. In the percent of HEAL recommendations given, the numbers in parentheses are the average number of recommendations given to a home total/possible number of recommendations in that category. For example, in the category of dust control, an average of 2.2 recommendations were given out of a total of 10 possible recommendations (22%). The percent of recommendations that were implemented by homes is the average number of behavior changes/number of recommendations.

Table 1. Effectiveness of recommendations

HEAL categories	Percent of homes with medium or high concern rating (n)[a]	Percent of homes with recommendation (n)[b]	Percent of homes that implemented recommendations (n)[c]
Dust control	100 (36)	85 (29)	62 (18)
Moisture problems	100 (36)	91 (31)	62 (21)
Indoor air	97 (35)	91 (31)	26 (8)
Hazardous products	100 (36)	38 (13)	62 (8)
Arts, crafts, and hobbies	64 (23)	6 (2)	50 (1)
Overall average	92	62	54

HEAL, Home Environmental Assessment List.
[a]At least one item was rated with medium or high concern (n = 36).
[b]At least one recommendation was given (n = 34).
[c]At least one recommendation was implemented.

Table 2. Effectiveness of recommendations based on the percent of HEAL items implemented by residents

HEAL categories	Percent of HEAL items with medium or high concern ratings[a]	Percent of HEAL recommendations given[b]	Percent of HEAL recommendations implemented[c]
Dust control	49 (20/41)	22 (2.2/10)	32 (0.7/2.2)
Moisture problems	33 (8/24)	21 (2.9/14)	38 (1.1/2.9)
Indoor air	23 (4.4/19)	6 (0.7/12)	29 (0.2/0.7)
Hazardous products	29 (9.6/33)	5 (0.7/15)	57 (0.4/0.7)
Arts, crafts, and hobbies	7 (2/26)	6 (0.06/1)	50 (0.03/0.06)
Overall average	28	12	41

HEAL, Home Environmental Assessment List.
[a]Average number of medium or high concern items per home/number of HEAL items in that category is shown in parentheses.
[b]Average number of recommendations given to a household/total possible number of recommendations in that category is shown in parentheses.
[c]Average number of changes in behavior/number of recommendations is shown in parentheses.

Specific actions taken by households. The top five most frequently implemented specific individual actions were 1) using fans or opening windows when the bathroom was in use; 2) increasing the frequency of cleaning and/or vacuuming; 3) opening windows to ventilate the home whenever weather permitted; 4) covering pillows and/or mattresses with vinyl or cloth barriers; and 5) removing shoes when entering the home.

Feedback from households. As part of the evaluation process, we asked the households what led them to make recommended changes and what prevented them from making changes (a household could report more than one response). In response to the question "What helped you in making the recommended changes in your home?" 20 households reported that health improvement was their motivation. Nine households reported that the information provided by the visit was informative and that the visit motivated them into implementing the recommendations. In contrast, 4 households identified the volunteer as the reason for their behavioral changes. These households reported that the volunteers were polite and courteous, and the information they conveyed was the reason for implementation. Other reasons for making changes included a desire to keep the home clean, the changes were easy to do, and implementation was inexpensive.

In response to the question "What prevented you from making the recommended changes in your home?" 15 households reported that lack of time was their reason. Eight households reported that implementation was too costly, specifically referring to the cost of covering pillows and mattresses with barrier clothes. Seven households reported that implementation would have been too much work, and six households reported that the changes would not have been helpful or were not needed. Other reasons were product esthetics (specifically referring to the pillow and mattress covers as being noisy or uncomfortable), lack of motivation, failure to remember the recommendations, and changes would be made soon.

Volunteers' effect and other possible associations. Both the income of the participating households and the experience of the volunteer were tested for an association with the number of behavioral changes (see Table 3). There was no evidence of association between behavior changes and income. The relationship between volunteers' experience levels and behavioral changes made by the households was significant (p = 0.02). Also, the relationship between the number of recommendations given and the number of behavioral changes made in homes was significant (p = 0.002).

Table 3. Spearman correlations between behavioral changes, experience of coach, number of recommendations, and family income

Variables	Spearman correlation (p-value)
Coaches' experience vs. number of recommendations given	0.15 (0.41)
Coaches' experience vs. behavioral changes made by households	0.39 (0.02)*
Family income vs. number of recommendations given	-0.06 (0.75)
Family income vs. behavioral changes made by family	0.02 (0.89)
Number of recommendations given vs. number of behavioral changes	0.50 (0.002)*

*Statistically significant (p = 0.05).

Discussion

This study found that a majority of the households that received a HEAL home visit changed at least one practice around their homes after the visit. In addition to following the documented recommendations, some households made changes that were not documented as recommended on their HEAL. Possibly, the households learned from their interaction with the volunteer coach and followed some verbal recommendations. This study also shows that in this sample of use of the MHE program there was always a lower percentage of recommendations made by the coaches than the percentage of perceived home problems (see Table 2). Further research could attempt to determine whether the average amount of behavior changes would increase if the number of recommendations followed more closely the number of problems identified.

All 36 households thought the HEAL visit was beneficial and would recommend it to their friends and families, indicating that they deemed this service worthwhile. Thus, in our sample population, the MHE program received a positive reception.

To the best of our knowledge this is the first report of behavioral change following a home health evaluation. Our study showed that an inexpensive volunteer program to educate households about indoor pollutants can affect the behavior of the residents. Our study was not able to test for an association between behavior change and respiratory illness. However, because the indoor environment is known to affect health (*11–19*), home health education may be a practical method of decreasing illness. Other investigators, in an attempt to educate asthmatic adults to adopt and adhere to these behaviors, reported use of a computer-based interactive instructional tool in addition to conventional counseling with written materials (*25*). This tool was found to be effective in reducing allergens in homes. This method, when compared with conventional counseling and written materials, provided greater clarity of the measures, opportunity for self-paced instruction, greater emphasis on certain aspects of allergen avoidance, and used an interactive format. Data from Huss et al. (*25*) suggest that the interactive component of the MHE program was responsible for the relative success seen in our study.

Several difficulties arose when conducting the behavioral study. One limitation of the study was that behavioral monitoring was based on telephone interviews. Ideally, the investigator could visit the homes before a home visit to determine baseline home practices and then again in a follow-up visit. Unfortunately, it was not feasible to visit the homes to evaluate behavioral changes. Given the limitations of the study, the telephone interview was the compromise between an in-home follow-up visit and a mail-back written survey by the households.

The interview 3 months after the initial visit only elicited a yes/no response to the question of whether the household had made the recommended change; this did not include the frequency of the behavior. Thus, it was possible for the family to do the change once during the 3-month period but no more. More detailed questioning and a clearer definition need to be established and conducted in future studies. Nevertheless, in the population studied, the MHE was found to be effective.

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